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DIVISION OF ENVIRONMENTAL HEALTH

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DIVISION OF
OIL, GAS & MINING

September 13, 1988

Mr. Gerald Schurtz
B.P. Minerals America
1515 Mineral Square
Salt Lake City, Utah 84112

Re: Barney's Canyon Project
Notice of Intent Comments

Dear Mr. Schurtz:

We have reviewed your 5 July 1988 and 22 July 1988 comment letters concerning the Barney's Canyon project Notice of Intent document and have the following comments:

- 1.a. i This comment has been acceptably addressed. We understand that runoff from the heap leach pad flexible membrane liner (before ore is placed on it) which is isolated by at least 200 feet from any active cyanide heap leach operation will be diverted to the storm water run off system. Operational procedures which will insure that these waters will not be contaminated by the cyanide leaching operations or spills must be included in the operational and maintenance manual which must be approved prior to initiation of operations.
- 1.a. ii We agree that monitoring water which will be discharged to the storm water runoff ponds, as described in 1.a.I. above, does not need to be monitored.
- 1.a. iii This comment has been already covered by 1.a.I. above. However, details of the barrier which will separate the runoff water from the heap leach pad liner and the active heap leach operation must be submitted with the design plans and specifications.
- 1.b. The concept of reducing the liquid contained in the process ponds before winter weather begins to a level which can adequately contain the design hydraulic situation is acceptable. However, the procedures and criteria to establish this level must be included in the operation and maintenance manual which must be approved prior to initiation of operations. In addition a condition of the construction permit will require that the Bureau of Water Pollution Control must be notified in writing each year prior to the onset of winter weather conditions that this level has been achieved.

- 1.c. This comment has been adequately addressed. The operational procedures described must be included in the approved operational and maintenance manual to insure the operator has a clear concept of what is to take place.
4. We are in agreement that the liner system which is currently proposed for the Barney's Canyon project i.e. process solution collection system, flexible membrane liner, secondary clay liner and leak detection system is acceptable to the Bureau of Water Pollution Control.

We understand per phone conversation with yourself on 11 August 1988 that B.P. Minerals agrees to remove the twenty (20) feet or so of gravel which exists on the ridges down to the underlying fine grain material where the heap leach pads and ponds will be built.

5. This comment has been adequately addressed.
6. This comment is covered in our response to comment No. 4 above.
9. This comment is covered in our response to comment No. 4 above.
13. The number and locations of proposed monitoring wells is satisfactory. We understand per phone conversation with yourself on 11 August 1988 that neutron and gamma logs will be made of the 4 proposed new wells. If the geophysical logs identify perched ground water zones then it may be necessary to install shallow lysimeters or piezometers to those zones.

We understand per phone conversation with yourself on 11 August 1988 that background data will be established for BC148 and the City of Copperton wells. We understand that these wells will be sampled on a monthly basis for standard constituents such as calcium, magnesium, sodium, potassium, iron, manganese chloride, sulfate, bicarbonate, total and free cyanide, copper, gold and silver. After a year's data has been collected BC 148 will be monitored on a quarterly basis and the city of Copperton will be monitored on a bi-monthly basis for total and free cyanide, copper, gold and silver. The standard constituents will be determined on these wells only on an annual basis thereafter.

We also understand per that phone conversation that the four proposed monitor wells will be monitored similar to the Copperton wells. After background has been established for the standard constituents and cyanide, etc, they will be monitored on a bi-monthly basis thereafter.

- 15.a. As indicated in several meetings we do not have a specific requirement for the components of the leak detection system. The only requirement which the Bureau has is that the leak detection system operate at a minimal head and have a reasonable response time. We understand from the information presented that average head in the leak detection system is 12 inches.

- 15.b. The purpose of the leak detection system underlying the liner system is to provide confirmation throughout the life of the project of the integrity of a properly designed and constructed liner system. This ability to monitor the performance of the liner system and detect leakage will dispell to a large degree unpredictable concerns which may result from uncontrollable circumstances such as adverse weather conditions during installation, variations in construction effort or procedures, variations in experience and control of flexible membrane liner installation, variations in underlying soils i.e. unpredicted settlement, limitations of field testing ability to establish the quality of a liner surface etc. The Bureau of Water Pollution Control's position for a leak detection system has been a leak detection media with a permeability rate of 1.0×10^{-2} centimeters per second minimum and a leak detection base with a permeability rate of 1.0×10^{-5} centimeters per second maximum. This also provides the minimum of three (3) orders of magnitude difference in permeability rate between the media and the base. In our design criteria approval letter of 15 August 1988 this is reiterated. The Bureau of Water Pollution Control has taken the position that there is a certain minimum flow rate below which leakage will not appear in the leak detection sump. The bureau recognized this and it is allowed so that all leaks in pad and pond liners larger than this can be detected and appropriately regulated. In addition the ability of the foundation material to attenuate process fluids resulting from sub minimum detectable leaks has been demonstrated. We emphasize that it has never been the policy of this Bureau that a leak detection system will be designed which will allow pollution of foundation materials for leakage flow rates greater than the minimum detectable leak. Given the materials available for this project discussed so far the following would be acceptable:

leak detection media permeability	leak detection base permeability
1.0×10^{-2} cm/sec.	1.0×10^{-5} cm/sec.
1.0×10^{-3} cm/sec.	1.0×10^{-6} cm/sec.

The Bureau of water pollution Control will consider other combinations which B.P. Minerals would prepare.

- 15.c. The concept of terminating each leak detection pipe in a 55 gallon drum of acceptable quality and construction is acceptable only if each drum is securely placed and the connection of the pipe to the drum is secure. Also only if each drum has an overflow device which will transmit liquids in excess of the capacity of the drum to a lined containment of adequate capacity to contain all flows.

- 15.d. According to Sergeant, Hauskins and Beckwith's letter of 15 August 1988, there will be at least three (3) inches of uncontaminated sand material in the leak detection system. Maximum particle size will be 1 1/2 inches for the six (6) inch thick layer.
- 15.e. This comment is covered by our comment No. 54 in this letter.
- 15.f. i We reaffirm the Bureau's position as stated already in 15.b that the leak detection system must be able to detect leakage rapidly and with a minimum amount of contamination of the foundation materials.
- 15.f. ii The material at the base of the leak detection system is only six (6) inches with a maximum permeability of 1.0×10^{-5} centimeters per second or less, which is three (3) orders of magnitude less than the permeability rate of the leak detection material. The six (6) inches of base material must also be free of and and gravel lenses or pockets.
- 15.f. iii After reviewing the Sergeant, Hauskins and Beckwith letter of 15 August 1988 we have concern that the performance concept of the leak detection base will not be achieved. To provide an appropriate interface beneath the leak detection media the base material must meet its design permeability and thickness criteria. To achieve a reasonable response time and prevent ponding on the base material the surface must be free from barriers to flow. Perhaps a workable approach would be to achieve proper compaction with the tamping foot or rubber tired rollers after which blading and smooth drum rolling of the surface would provide the barrier free final surface.
- 15.g. The ability of the leak detection media to function will be established by quality control. Parameters such as thickness of clean sand, continuity of the sand conduit between collection pipes and the minimum permeability of the sand must be verified in the field.
19. This comment has been adequately addressed.
20. The presentation made concerning the sizing of the process ponds appears reasonable. The verification of adequate process solution pond draw down prior to the onset of winter conditions will be verified as stated in comment 1.b. of this letter.
21. This comment has been acceptably addressed. We understand that all water from the Barney's Canyon pit will be contained on the site either within the pit or as process water. If this water will be used for dust suppression its quality must be established first. Also application rates and procedures must be stated in the operation and maintenance manual to insure that surface run off will not occur.

- 22.1. This comment has been acceptably addressed.
- 28.1. The schedule for leak detection notification as outlined in our 8 June 1988 letter applies to both pads and ponds. The criteria applies to any liquid found in the leak detection system. Once it has been verified that process fluids are leaking into the leak detection system the leaching must stop until suitable repairs approved by the Bureau, have been made. If the flow of leakage through the liners can not be stopped then that facility must be decommissioned according to the criteria outlined in the construction permit.
29. We understand per phone conversation with yourself on 11 August 1988 that the maximum time it will take to empty a process pond once a leak has been detected is seven (7) days. It is understood that all process fluids removed from the pond will be totally contained within an acceptably lined area.
34. This comment is modified as per your request. The design and construction of domestic sanitary wastewater facilities must be approved prior to initiating operations of these facilities. Nevertheless, this requirement will become a condition of the construction permit, the Salt Lake City-County Health Department must review and approve such system.
39. We understand that precautions for placing the protective blanket on the geomembrane will be included in the construction specifications which will be submitted for review.

We appreciate the submittal of information concerning your consulting Engineer Sergeant, Hauskins and Beckwith.

Page 1 of the 1 June 1988 Sergeant, Hauskins and Beckwith letter states in part "provided sufficient quality control testing is performed during installation, field welded seams should also be able to withstand the strains induced as a result of the anticipated settlement." We request that a schedule of appropriate destructive and non destructive field seam tests and their frequency be compiled and submitted in the detailed engineering plans and specifications. Also included must be procedures for retesting in case of a test failure.

44. Perhaps some clarification is in order concerning your response to this comment. This comment in our 8 June 1988 letter was not a request for any additional action or information but rather a statement of agreement that the liner system will provide the protection for the environment which will be required by the Bureau of Water Pollution Control. The material naturally occurring beneath the heap leach pad will provide an additional back up to the required system in the event of a catastrophic failure, or if fluids flow into the leak detection system at or below the minimum detectable rate occur. The information provided concerning attenuation of cyanide by the natural materials beneath the pad is valuable in establishing the nature of naturally occurring additional protection and is appreciated.

49. The neutralization criteria will be that specified in our design criteria approval letter dated 15 August 1988.
50. We understand that once the spent heap leach ore piles have been neutralized according to the criteria specified in our 15 August 1988 letter then precipitation on these piles which may flow through can be discharged to the environment. We understand that fencing will be maintained around the reclaimed facilities for at least three (3) years as required by the Division of Oil, Gas and Mining.
51. We understand that when the process ponds are decommissioned sludge remaining after being neutralized will be tested as recommended in "Test Methods for Evaluating Solid Waste SW-846" and other applicable EPA guidance to determine if they are a hazardous waste. If these sludges are classified as a hazardous waste they will be disposed of as required by those regulations. If not classified as a hazardous waste they will be reclaimed in place.
52. The sixty (60) mil HDPE flexible membrane liner material is accepted as the primary liner for the Heap Leach pad and process ponds for the Barney's Canyon project based on the recommendation of your consulting engineer, JBR Consultants and the following:
 - 52.a. Sergeant, Hauskins and Beckwith Consulting Engineers test work which is summarized in comment No. 56 of your 29 April 1988 letter which states that the 60 mil HDPE membrane and the remainder of the liner system will be stable on the proposed project seven (7) percent slope.
 - 52.b. Sergeant, Hauskins and Beckwith Consulting Engineers letter dated 1 June 1988 which states that the flexible membrane for this facility, sixty (60) mil HDPE, will be adequate to withstand all strains associated with ore loading.
 - 52.c. It has already been concluded that the chemicals, additives etc, which will be used in the Barney's Canyon heap leach process will be the same as are used throughout the industry. Considering that HDPE is commonly used throughout the industry for heap leach operations exposed to these chemicals, additives etc. and has performed satisfactorily it is concluded the HDPE will be chemically compatible.
- 54.a. This comment has been acceptably addressed.
- 54.b. We understand that the leak detection sand will have 3 per cent maximum passing the # 200 sieve.
- 54.c. The specification for the material to construct the secondary clay liner is acceptable and we understand it will be included in the specifications which will be submitted for review.

The one (1) inch maximum particle size exceeds our recommended 3/8 inch maximum value however it will be acceptable if the specifications on the finish surface insure that none of the rocks will protrude above the surface, and it is demonstrated both in the laboratory and insitu that the 1.0×10^{-7} centimeters per second permeability rate is being achieved.

- 54.d. We understand that the project specifications will indicate that the maximum allowable permeability rate for the secondary clay liner will be 1.0×10^{-7} centimeters per second.
- 54.e. The specifications for the secondary clay liner moisture content during compaction is acceptable based on the understanding that the moisture content will be sufficient to insure adequate remolding of the clay to destroy all interclod spaces.
- 54.f. Based on the 1 June 1988 letter from Sergeant, Hauskins and Beckwith which evaluated the heap leach pad and pond foundation material for stability we conclude that there is adequate support to insure the integrity of the liner systems.
- 54.g. The comment has been acceptably answered and our response in 54.c. of this letter is sufficient.
- 54.h. This comment about requirements for field quality control testing is modified as follows:
- i Moisture/density tests every 50 cubic yards over the entire surface of each lift of the secondary clay liner.
 - ii Thickness verification every 50 cubic yards over the entire surface of each lift to the secondary clay liner.
 - iii Gradation tests every 500 cubic yards during initial startup and every 1500 cubic yards through out the remainder of the project for each lift.
 - iv Triaxial permeability permeability tests every 500 cubic yards for the first 2000 cubic yards. An additional triaxial permeability test must be conducted for each 8500 cubic years or part thereof of secondary clay liner placed thereafter, for each lift placed.

We understand per our meeting of 9 August 1988 that field quality control testing specified above will be spaced across the secondary clay liner surface according to the following concept. For each specified volume of clay liner material placed the designated test will be conducted within that area according to the judgment of an experienced, well qualified representative of the third party inspection organization.

Mr. Gerald Shurtz
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A condition of the construction permit will be that on completion of the project certified as built drawings must be submitted with the test results plotted at the appropriate locations for each of the tests required.

54.i. The construction of the secondary clay liner in a single twelve (12) inch lift is acceptable to the Bureau based on our discussion that the clay will be blended in a pug mill prior to placement to achieve proper moisture content and mixing. However it must be understood that the determined laboratory densities specified in the approved construction specifications must be achieved and verified throughout the thickness of the clay liner.

56. This comment has been acceptably addressed.

This concludes our comments on your July letters.

Please call Mr. Charlie Dietz if there are any questions.

Sincerely,



Don A. Ostler, P.E., Director
Bureau of Water Pollution Control

cc: Mr. Greg Boyce, General Manager, Barney's Canyon Mine
Mr. Kent Miner, Salt Lake City/County Health Department
Mr. Brian Buck, JBR Consultants
Mr. Lowell Braxton, Oil, Gas and Mining
Mr. Ross Pino, 310 East State Highway, Copperton 84006
Mr. Steve Harris, Magna Area elected council, P.O. Box 456 Magna
Mr. W. Blaine Milner, Chairman, Copperton Improvement District

CGD/ag/jgh

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